The opinion in support of the decision being entered today was not written for publication in a law journal and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KYUSIK SIN, NINGJIA ZHU
and YINGJIANN CHEN

Appeal No. 2005-1462
Application No. 09/828,635

ON BRIEF

Before KIMLIN, WARREN and KRATZ, Administrative Patent Judges.

KIMLIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-20.

Claim 1 is illustrative:

1. A sensor comprising:

first, second and third ferromagnetic layers that are interleaved with first and second nonferromagnetic layers, said first nonferromagnetic layer adjoining said first and second ferromagnetic layers, said second nonferromagnetic layer adjoining said second and third ferromagnetic layers, said first and third ferromagnetic layers having magnetic moments with directions that are fixed in response to an applied magnetic field, said second ferromagnetic layer having a free portion and a fixed portion, said free portion having a magnetic moment with

a direction that rotates in response to said applied magnetic field and said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field.

The examiner relies upon the following references as evidence of obviousness:

Kurosawa et al. (Kurosawa)	5,910,868	Jun. 8, 1999
Iwasaki et al. (Iwasaki)	5,991,125	Nov. 23, 1999
Watanabe et al. (Watanabe)	5,995,338	Nov. 30, 1999
Saito et al. (Saito)	6,122,151	Sep. 19, 2000
Ishikawa et al. (Ishikawa)	6,396,734	May 28, 2002
Hasegawa et al. (Hasegawa)	6,496,338	Dec. 17, 2002

Appellants' claimed invention is directed to magneto-resistive (MR) sensors comprising first, second and third ferromagnetic layers that are separated by first and second nonferromagnetic layers. The first and third ferromagnetic layers have magnetic moments with directions that are fixed in response to an applied magnetic field, whereas the second ferromagnetic layer has a free portion and a fixed portion. The fixed portion of the second ferromagnetic layer is overlapped with the third ferromagnetic layer, while the free portion of the second ferromagnetic layer is not overlapped with the third ferromagnetic layer. The second ferromagnetic layer is covered with a nonmagnetic exchange coupling layer. According to appellants, "[t]he exchange coupling layer and ferromagnetic layer form a synthetic antiferromagnetic structure with part of

the free layer, providing bias that reduces magnetic instabilities at edges of the free layer" (page 2 of principal brief, second paragraph).

Appealed claims 6, 7 and 17-20 stand rejected under 35 U.S.C. § 112, first paragraph, description requirement. Claims 17-20 stand rejected under 35 U.S.C. § 112, second paragraph. In addition, the appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

(a) claims 1-5, 10-14 and 16 over Iwasaki in view of Hasegawa;

(b) claims 6, 7 and 9 over the stated combination of references further in view of Ishikawa;

(c) claims 8 and 15 over Iwasaki in view Hasegawa and Watanabe;

(d) claims 1-4, 10-12, 14 and 16 over Saito in view of Watanabe and Kurosawa;

(e) claims 5 and 13 over the references stated in (d) above further in view of Hasegawa; and

(f) claims 6, 7 and 9 over Saito in view of Kurosawa, Watanabe and Ishikawa.

We consider first the examiner's rejection of claims 6, 7 and 17-20 under § 112, first paragraph. According to appellants,

layer 102 of Figure 3 is the first nonferromagnetic layer of the three nonferromagnetic layers recited in claim 6. However, appellants have not rebutted the examiner's logical argument that since claim 1 requires that the first and second ferromagnetic layers are interleaved with the first nonferromagnetic layer, layer 102 cannot be the first nonferromagnetic layer. Clearly, layer 102 is not positioned between two ferromagnetic layers. Consequently, we will sustain the examiner's § 112, first paragraph rejection.

We will not sustain the examiner's § 112, second paragraph rejection of claims 17-20. In essence, we agree with appellants that the claims need not refer to the same layers described in the specification as first, second, third and fourth ferromagnetic layers. It is only required that one of ordinary skill in the art would reasonably understand the structure of the claimed sensor in light of the accompanying specification.

We next consider the § 103 rejection of claims 1-5, 10-14 and 16 over Iwasaki in view of Hasegawa. As recognized by the examiner, Iwasaki fails to teach or suggest a third ferromagnetic layer which overlaps only a portion of the second ferromagnetic layer which produces free and fixed portions in the second ferromagnetic layer. The examiner proposes to modify the third

ferromagnetic layer of Iwasaki in accordance with Hasegawa "in order to suppress Barkhausen noise and to pin only part of the free magnetic layer by exchange coupling" (page 7 of Answer, last paragraph). According to the examiner, the proposed modification would necessarily result in the claimed "second ferromagnetic layer having a free portion and a fixed portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field and said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field" (claim 1). However, the examiner has not refuted appellants' argument that the proposed modification of Iwasaki is unlikely to result in pinning the free magnetic layer because intermediate layer 12 of Iwasaki is gold, silver, or an alloy that mainly contains copper, gold or silver. In contrast, appellants' specification teaches that relevant coupling layer 110 is made of ruthenium, iridium or rhodium. In addition, appellants point out that intermediate layer 12 of Iwasaki has a thickness of 3 nm, while coupling layer 110 of appellants has a thickness in the range of between about 5 and 10 Å (see page 5 of specification, second paragraph). Since this argument has not been addressed, the examiner has not satisfied the burden of demonstrating that the proposed

modification of Iwasaki necessarily results in the claimed sensor. It is well settled that a determination of inherency cannot be established by probabilities or possibilities, and it is incumbent upon the examiner to establish the inevitability of the inherency based upon factual evidence or persuasive scientific reasoning. See In re Oelrich, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981).

Accordingly, we cannot sustain the examiner's § 103 rejection of claims 1-5, 10-14 and 16 over Iwasaki in view of Hasegawa. Nor can we sustain the separate rejections of claims 6, 7 and 9, and 8 and 15 based on the combination of Iwasaki and Hasegawa inasmuch as Ishikawa and Watanabe do not remedy the basic deficiency discussed above.

Finally, we turn to the § 103 rejections based on Saito in combination with Watanabe and Kurosawa. The examiner recognizes that Saito does not teach that the second ferromagnetic layer has a fixed portion and a free portion and a third ferromagnetic layer that overlaps the fixed portion but does not overlap the free portion. In addition, the examiner appreciates that neither Saito nor Watanabe discloses the presently claimed second nonmagnetic layer that is interleaved between the second and third ferromagnetic layers. It is the examiner's position,

however, that, based on Kurosawa, it would have been obvious to modify Saito, as modified by Watanabe, to form the claimed second nonmagnetic layer "in order to improve the Hua of an antiferromagnetic bias layer deposited on the third ferromagnetic layer" (page 13 of Answer, fourth paragraph).

We agree with appellants that since Saito, as modified by Watanabe, does not include a second nonferromagnetic layer adjoining the second and third ferromagnetic layers, it cannot be reasonably concluded that the modified structure of Saito necessarily or inherently possesses the properties of the claimed sensor. As for the examiner's further proposed modification of Saito by adding the nonmagnetic layer of Kurosawa, the examiner has not rebutted appellants' argument that the tantalum nonmagnetic layer of Kurosawa cannot function as the claimed exchange coupling layer. Appellants urge that "the Examiner has not provided any reference that teaches that tantalum can be used as an exchange coupling layer between ferromagnetic layers, and Appellants respectfully assert Ta is not known by one of ordinary skill in the art as an exchange coupling layer" (sentence bridging pages 12 and 13 of Reply Brief). According to appellants, "[s]hould the Ta layer 9 exchange couple MR layer 3 to SAL layer 8, the device shown in FIG. 13 of Kurosawa et al.

would not work" (page 12 of Reply Brief, last paragraph). As a result, we are not satisfied that the examiner has carried the initial burden of establishing that incorporating the nonmagnetic tantalum layer of Kurosawa into the sensor of Saito would necessarily result in the claimed "second ferromagnetic layer having a free portion and a fixed portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field and said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field" (claim 1). While the examiner states that "appellants' argument is moot since it is *not* the spacer layer which is being changed in the Saito et al. invention" (page 22 of Answer, last sentence), the section of Kurosawa cited by the examiner, column 3, lines 63-65, states that the Hua can be securely increased by heat treatment when an underlying layer of Ta is used. It is appellants' argument that Ta cannot function as the claimed exchange coupling layer.

Accordingly, we cannot sustain the examiner's § 103 rejection of claims 1-4, 10-12, 14 and 16 over Saito in view of Watanabe and Kurosawa, nor the examiner's § 103 rejection of claims 5 and 13, and 6, 7 and 9 over the further teachings of Hasegawa and Ishikawa, respectively.

In conclusion, based on the foregoing, the examiner's § 112, first paragraph rejection of claims 6, 7 and 17-20 is sustained, whereas the rejection of claims 17-20 under § 112, second paragraph, is reversed. Also, all the examiner's rejections under 35 U.S.C. § 103 are reversed. Consequently, the examiner's decision rejecting the appealed claims is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv) (effective Sep. 13, 2004; 69 Fed. Reg. 49960 (Aug. 12, 2004); 1286 Off. Gaz. Pat. Office 21 (Sep. 7, 2004)).

AFFIRMED-IN-PART

EDWARD C. KIMLIN)
Administrative Patent Judge)
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CHARLES F. WARREN) BOARD OF PATENT
Administrative Patent Judge) APPEALS AND
) INTERFERENCES
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PETER F. KRATZ)
Administrative Patent Judge)

ECK:clm

Mark A. Lauer
6601 Koll Center Parkway
Suite 245
Pleasanton, CA 94566